the preparation of the English ephemeris, and perhaps are so still. Bessel gave a more thoroughly consecutive discussion, which Chauvenet followed in his treatise, and this last forms the basis of Mr. Buchanan's work. The practical part of the arrangement does not seem to be easily systematised. A computer finds some difficulty in translating the formulæ into numbers. There are to the uninitiated continual ambiguities about the quadrants; and the manner in which angles are to be reckoned is frequently a stumbling block to the unwary. Perhaps these little difficulties are more noticeable in Woolhouse's method than in Bessel's, but it is with the view of limiting these troubles and of giving a convenient arrangement to the whole of the work that Mr. Buchanan has written his book. In his time he must have met with all the difficulties with which a young computer has to contend, and must have removed these out of the path of many. Knowing these pitfalls, he has done his best to get rid of them by suitable explanations, and probably with success. But those who have conducted pupils through carefully worked examples know only too well that a fresh set of difficulties is apt to reappear with a new case.

The author has divided his book into two parts. In the first he treats of solar eclipses and the method of deriving the various curves which are necessary for the exhibition of the whole circumstances of the phenomenon on a map. Here we get the north and south limits of total and partial eclipses, the position where the eclipse begins and ends with the sun in the horizon, and one can follow the method by which are drawn those weird curves on the eclipse maps that accompany every nautical ephemeris. By way of adding a little lightness to a rather dreary subject, we may notice some curiosities the explanation of which is not very readily seen without the assistance of a competent guide, such as the occurrence of a north limiting curve of totality falling south of the south limiting curve. Ingenuity might construct some further troublesome problems of this nature when the clue is furnished, and one can imagine an examiner exulting over the discovery of such oddities, affording as they do opportunity for worrying unhappy candidates who fall into his hands.

In the second part of the book we have detailed the method of computing the circumstances of lunar eclipses, occultations of stars by the moon, and of the transits of Venus and Mercury. These are practically particular cases of the same problem as that treated in the first part, simplified by certain conditions. In the case of the lunar eclipse, the absolute position of the moon and shadow are independent of the position of the observer on the earth, and therefore the effects of parallax can be treated much more simply. We notice that the semi-diameter of the shadow is increased by the fiftieth part of its amount, in preference to the older estimate of 1/60, but the whole question of semi-diameters is a troublesome one, which will soon have to be treated with great rigour. The occultation semi-diameter is not altogether satisfactory, and some international convention is needed to secure uniformity. From a letter from Dr. Downing, quoted by the author, we gather that the occultation diameter of the moon, as used in the preparation of the English "Nautical Almanac," differs $2''.36$ from that employed in eclipse calculations. But we find a little difficulty in following the author in his reference to authorities. In the matter of lunar parallax, Adams is not quoted, and Lardner's "Handbook of Astronomy," or Proctor on "The Moon," can scarcely be considered original and trustworthy sources.

W. E. P.

ENGLISH FIELD-BOTANY.

Flora of Hampshire, including the Isle of Wight. By Frederick Townsend, M.A., F.L.S. Second edition. Pp. xxxviii+658. (London: Lovell Reeve and Co., Ltd., 1904.) Price 21*s.* net.

ENGLISH field botanists frequently complain that the British flora has not yet received the careful critical attention which has been lavished on Continental floras. To a certain extent this is doubtless true. We have no manual that for thoroughness of treatment and wealth of reference to original descriptions and type-specimens can compare with Rouy and Foucault's "Flore de France"; at the same time there is an abundance of valuable information scattered through our numerous natural history journals only waiting for some energetic and widely experienced systematist to collate and bring together in a really satisfactory British flora. There are several botanists eminently fitted for such an undertaking, and it is urgently to be desired that one or more of them should take the matter in hand. Meanwhile, our numerous and rapidly accumulating county floras are paving the way to a complete botanical survey of the British Isles.

In Mr. Townsend's "Flora of Hampshire and the Isle of Wight" we have one of the best books of its class, and the work and careful attention expended upon its production must have been very considerable. The volume opens with a chapter on topography and climate. This is followed by an account of the geological structure of the district, including a summary of Mr. Clement Reid's researches on the fossil seeds of the Stone and Silchester beds of the newer Tertiary formation. In his list it is particularly interesting to notice the names of several plants usually regarded as weeds of cultivation, or as colonists, such as *Brassica alba,* Boiss., *Thlaspi arvense,* L., *Linum usitatissimum,* Linn., and also damson and plum.

The now generally approved method of dividing a district into botanical areas according to its river-systems is here in the main followed, and a useful map of the county is appended. Turning to the systematic section by far the larger portion of the book—so many points call for attention that it is quite impossible within the limits of a short notice to mention more than a few of them. In the section devoted to Ranunculus, what appears to be a satisfactory account of the forms of *R. acris* is given; this will be appreciated by many collectors. The name *Nymphaea alba,* Linn., is retained instead of *Castalia speciosa,*

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Salisb., which found favour in the eyes of the editors of the "London Catalogue" (ninth edition). *Viola calcaria,* Bab., appears as var. β of *V. hirta,* Linn., though the author admits an inclination to regard it as a starved or stunted form rather than a variety. No mention is made of *V. calcaria,* Gregory, which has been cultivated, and appears to be a good species.

V. canina, Linn., is given as synonymous with *V. flavicornis,* Sm., non Forster, while *V. ericetorum,* Schrader, appears as a hybrid *canina* × *lactea.* All botanists will not find themselves in agreement with Mr. Townsend upon this point, for *V. ericetorum* is sometimes abundant where *V. lactea* is extremely scarce. Perhaps it may be hoped that cultivation will settle the question, especially if it be found that hybrid violas obey Mendel's law of segregation.

The list of Rubi brings the number up to eighty-five, making the county, with one exception, the richest in brambles of any in the British Isles. Some useful notes on the genus Erythræa are given, and the variety *sphaerocephala,* Towns., of *E. capitata,* Willd., is beautifully figured; the author now considers that the plant does not merit a varietal name.

Among the Monocotyledons, the Rev. E. F. Linton's *Orchis ericetorum* is fully described. It appears to be a well marked plant, and the fact that it grows only on heaths while the chalk plant is typical *O. maculata* cannot be said to militate against its claim to specific rank in view of the parallel case of distribution of the two plants included under the name *Valeriana officinalis,* Linn. But here again there may be great virtue in cultivation. It is satisfactory to find the truth told about *Ruscus aculeatus.* The plant with staminate flowers has narrower cladodes than the pistillate plant, and there is no evidence for a narrow-leaved and a broad-leaved variety.

In an appendix appear notes on several plants, amongst which are *Stellaria umbrosa,* Opiz, and *S. media,* Linn. (both of which are fully diagnosed), *Prunus spinosa,* Linn., *P. fruticans,* Weihe, *P. insititia,* Linn., and *P. domestica,* Linn. An account of Murbeck's arrangement of the gentians is given, and all the forms of Euphrasia and Salicornia noted in the county are described. So much matter of general interest is brought together that no field botanist, be he a native of the district or a worker in any other part of the country, can afford to neglect this volume.

SANITARY ENGINEERING.

Small Destructors for Institutional and Trade Waste. By W. Francis Goodrich. Pp. 127. (London: Archibald Constable and Co., Ltd., 1904.) Price 4*s.* net.

MR. GOODRICH'S book on "Refuse Disposal and Power Production," which dealt with the problems arising in the disposal of civic waste, was recently reviewed in these columns (May 12, 1904, vol. lxx. p. 25); in the present volume the same author treats of the equally important subject of the disposal of institutional and trade refuse, that is, with the design and working of small destructors. The aim has been to make clear the fact that high temperature working is as vital in the small as in the large destructor.

In an introductory chapter Mr. Goodrich lays down the principles which must be observed in the design of small destructors, and he points out that it is possible to operate at a low working cost such destructors when built on modern lines. The weak points in the design of the earlier forms were precisely those which were found in the early forms of large municipal destructors, namely, low temperature system of working, slow combustion, and inadequate and unsatisfactory methods of feeding the refuse into the cells; these difficulties, however, have all been overcome, and at the present day small destructors for use in institutions such as isolation hospitals, hotels, &c., can be obtained as satisfactory in every respect as the large ones now so commonly employed. On account of the unpleasant substances which have to be dealt with in many of these institutional destructors, they are often neglected, and proper supervision over them is not maintained; this leads to the refuse being improperly fed into the destructor; in a good modern type there is no risk of this misuse, as it is impossible to feed the destructor in any other way than that originally provided by the designer.

A number of typical destructors suitable for such institutions are described and illustrated, the drawings being fairly complete. In thinly populated districts it is often advisable to have a portable destructor, and two very successful ones of this type, namely, a Horsfall and a Meldrum, are described. Such portable destructors would be invaluable during campaigns and in our home training-camps. How dangerous the waste from a large camp may become to health was vividly shown during the inquiry by the Royal Commission into the war in South Africa. Many of the medical witnesses expressed the opinion that hundreds of lives might have been saved had the necessary steps been taken to destroy camp refuse properly and to supervise thoroughly the sanitary condition of camps. In America, which, strangely enough, has lagged behind in the adoption of municipal destructors, there has been a considerable development in the utilisation of the smaller forms, both for hospitals and for hotels. The latter portion of the book treats of the disposal of trade refuse, and the author points out how valuable from the point of view of generation of power this trade refuse often is. Such trade refuse can only be burnt in boilers specially designed for fuel of low calorific power, and where the boilers are properly designed there is no difficulty in utilising it. A number of different types of furnaces and boilers suitable for use with trade waste are described and illustrated in these chapters.

The last few pages of the book are devoted to a discussion as to the advantages of disposing of carcases of diseased and condemned beasts by means of suitably designed destructors. The book will be found, like Mr. Goodrich's other books upon this important branch of sanitary engineering, extremely valuable by all who are engaged in dealing with the disposal of solid refuse. T. H. B.

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